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Cerebral oxygenation, exercise capacity, cardiac output and cognitive performance in patients with coronary heart disease

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Keywords: Coronary heart disease; Cognition; Cerebral oxygenation; Physical capacity

Objectives.– Recent data suggested that coronary heart disease (CHD) was associated with non-amnesic mild cognitive impairment. The purpose of our study was to assess cognitive performances at rest, VO_2max, cardiac output, and cerebral hemodynamic changes during maximal exercise in patients with stable CHD.
Methods.– Twenty stable fit CHD patients (70.8 ± 9.1 years), 10 healthy age-matched (70.5 ± 8.8 years), 10 middle aged controls and 10 young controls (< 40 ans) were included. We assessed cognitive performance with a standard battery of pen and paper tests, maximal exercise test on ergocycle with gas exchange analysis with non-invasive cardiac output measurement and Near-Infrared Spectroscopy (NIRS) oxygenation indices at the brain level.
Results.– There was no intergroup difference in VO_2max or maximal cardiac output between cardiac and healthy age-matched individuals. Some cognitive tests, especially for executive functioning, were significantly better for the healthy matched group (Trail Making Test-B; Inhibition/Flexibility Stroop Task and Backward Digit Span, $P < 0.05$). For NIRS signals, we observed an increase in deoxyhemoglobin (HHb) for maximal intensities and the classical inverted U-shaped curves for oxyhemoglobin (O_2Hb) and hemoglobin difference (Diff Hb = O_2Hb − HHb) in each group. Between cardiac and healthy matched subjects, only the HHb parameter had significant higher changes for maximal intensities. About fitness, intra-CHD group differences were observed with higher amplitudes in NIRS changes for fit CHD subjects. In control groups, middle aged and young subjects had significant higher performances in VO2max, most of cognitive tests associated with higher amplitudes changes for NIRS indices while exercising.
Conclusion.– In spite of comparable maximal exercise tolerances and cardiac outputs, CHD individuals presented some reduced cognitive performances with an inter-individual variability of cerebral NIRS signals changes especially with age and fitness.

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Training adaptations in patients with slowly progressive neuromuscular diseases

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Keywords: Exercise test; Neuromuscular diseases; Exercise tolerance

Introduction.– Physical activities for patients with neuromuscular diseases (NMD) are safety and could maintain functional capacity, however these effects were not constant in studies [1]. Retraining programs are individualized and based on a detailed analysis of patient's physical activity adaptations are necessary. Very few studies focused on these adaptations in people with NMD.
Objective.– To describe and identify consumption oxygen uptake kinetics during exercise tests in NMD patients.
Methods.– This descriptive study collected maximal exercise tests with gas analysis, which were performed at Reims Champagne Ardennes University between May 2008 and July 2011. 44 exercise tests were divided into three NMD groups: genetic-CMT neuropathy ($n = 18$), muscular dystrophies ($n = 17$) and metabolic myopathies ($n = 9$). The limitation criteria during exercise tests were analyzed in accordance with the literature [2,3].
Results.– Primary symptoms, which stop ergometer exercises, were muscular symptoms (63.6%). Patients had early onset of the first ventilatory threshold. Ventilatory limitation occured with lung volume recruitment defects (61.4%) and increasing lack of O_2 pulse (cardiac limitation) were observed in 54.5% of cases, without cardiac or pulmonary abnormality examinations at rest.
Discussion.– Studying exercise adaptations in patients with neuromuscular diseases seems useful. On the one hand, to define the best individualized parameters on which an NMD patient can exercise. On the other hand, to evidence a cardiac or pulmonary disadaptation, not shown by rest investigations.

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Effects of a 4-month high-intensity interval training associated with resistance training program on cognitive performance, cerebral oxygenation, exercise capacity and cardiac output in middle-aged overweight subjects

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Keywords: Overweight; Exercise; Interval training; Cognition; Cerebral oxygenation

Objectives.– Many interventional studies have reported the benefits of regular physical activity on cognitive aging, even more when different exercise modalities were combined. The purpose of our study was to assess the effects of a training intervention combining high-intensity interval training and resistance training on anthropometric data, exercise tolerance, cognitive performance and cerebral oxygenation during exercise in overweight adults.
Methods.– Six adults (4 males) (49.4 ± 8.7 years; BMI: 29.4 ± 1.4 kg/m^2) performed a 4-month training program including 2 high-intensity interval training (HIIT) sessions on ergocycle, and 2 resistance training sessions per

week with a facultative mild intensity continuous session. Body composition, blood analysis, cognitive performances, maximal exercise tolerance with gas exchange analysis, non-invasive cardiac output measurement and Near-Infrared Spectroscopy (NIRS) cerebral signals were measured before and after training.
Results.– We found significant improvements in maximal power and VO_2max, a decrease in maximal heart rate without other hemodynamic changes. Weight, BMI, fat mass, and waist circumference significantly decreased ($P < 0.01$), whereas no effects on biological parameters, nor on muscle mass were observed. Some cognitive tests for executive functions (Digit Symbol Substitution Test, $P < 0.01$; Digit span, $P < 0.05$) and memory (Rey Auditory Verbal Learning Test, $P = 0.03$) significantly improved. Regarding the kinetics of the NIRS signals during exercise, both deoxyhemoglobin (HHb) and hemoglobin difference between oxy- and deoxyhemoglobin (HbDiff) had higher amplitudes after training ($P < 0.05$).
Conclusion.– In addition to improvements in exercise tolerance, a program combining HIIT and resistance training could improve executive functions in overweight adults. These results were associated with changes in cerebral oxygenation measured using NIRS.

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Short- and long-term effect of an aerobic training programme on gait parameters in the chronic hemiplegic patient

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Keywords: Chronic stroke; Aerobic training
Objective.– Aerobic training has a short-term effect on gait parameters in chronic hemiparetic patients [1]. The long-term effects are not known. The objective of this work was to analyse the time course of hemiparetic gait at more than 1 year.
Material/Patient and methods.– Retrospective study.
Twenty-seven chronic stroke survivors with residual autonomous hemiparetic gait participated in a programme of aerobic training > 6 months after stroke. Seventeen patients were seen again at more than 1 year. They were evaluated at T = 0, T = 4 weeks and T > 1 year by a 6-minute walk (TDM6), a 10-meter test with maximal speed (10 m), and a get up and go test (GUG). Statistics: non-parametric tests (Friedman, Wilcoxon, Mann and Whitney).
Results.– There was a statistically and clinically significant improvement of TDM6, 10 m and GUG at 4 weeks with a residual effect at more than 1 year in spite of a significant change of the TDM6 between the end of the programme and at more than 1 year.
Discussion.– This study shows the very positive effects of a programme of aerobic training on gait parameters in the chronic stroke population. The goal is to maintain regular adapted physical activity at sufficient intensity at home to preserve the maximal benefit of the training programme. A therapeutic educational programme and an inpatient-outpatient network will improve the maintenance of aerobic capacity while sustaining an adapted level of physical activity.

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Usefulness of physical reconditionning using stationary bike at home on fatigue for multiple sclerosis patients

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Keywords: Multiple sclerosis; Exercise; Fatigue
Objective.– To measure the impact at 2 months time of stationary bike home training on fatigue among under 50 years old multiple sclerosis patients [1].
Methods.– A multicentre non-randomized pilot study evaluating the feasibility of home stationary bike training was conducted. Patients with MS, complaining of predominant physical fatigue, less than 50 years old, without cardiovascular contra-indications, with an EDSS, without cognitive impairment, or relapse in the last 3 months were included. Patients with musculoskeletal, neurological or cardiovascular impairment not allowing stationary cycling, or without any interest for reconditionning program were excluded. The intervention was a short educational session (one hour time) to use stationary bike (home delivery) at first ventilatory threshold, 25 min per session, 3 sessions per week for 8 weeks long. The primary endpoint was fatigue [2] (EMIF), secondary endpoints qualitative and quantitative compliance, walking speed (7.5 m test) and endurance (6 min walk test), health-related quality of life (SF-36). The number of subjects required was 30. Results 25 patients was finally included and analysed. Home stationary bike program, allowed a significant improvement of fatigue on the total EMIF, walking speed and endurance, without significant effect on the quality of life.
Discussion.– This study demonstrated the feasibility of home stationary bike reconditionning with limited supervision. The main limitations are lack of control group, a limited number of subjects, and low EDSS at baseline. In absence of monitoring, long term effect still unknown.

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